



88709  
SERIAL NO.

PATENT

SEP 07 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

**Donald K. Harper, Jr.**

Serial No.: **09/661,547**

Group Art Unit: **2833**

Filed: **September 14, 2000**

Examiner: **A. McCamey**

For: **HIGH DENSITY CONNECTOR**

**DECLARATION UNDER 37 C.F.R. § 1.131**

Assistant Commissioner  
for Patents  
Washington, D.C. 20231

Dear Sir:

I, Donald K. Harper, Jr., based on personal knowledge, hereby declare as follows:

1. I am a staff product engineer at FCI USA Incorporated located at 825 Old Trail Road, Etters, Pennsylvania.
2. I am the sole inventor of the subject matter disclosed in, and claimed in claims 1 through 25 of U.S. Patent Application number 09/661,547.
3. Prior to April 27, 1999, I had completed and reduced to practice the invention disclosed and claimed in U.S. Patent Application number 09/661,547, in the United States of America, a NAFTA and WTO country, as evidenced by the following:
  - a. Prior to April 27, 1999, I conceived of, and prepared a drawing with a textual summary of a device in accordance with that disclosed and claimed in U.S Patent Application number 09/661,547. A photocopy of the drawing and

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TECHNOLOGY CENTER 2800

textual summary, from which dates have been redacted, is attached hereto as Exhibit A.

- b. Prior to April 27, 1999, I instructed L. Robin Johnson to prepare engineering drawings for the purpose of manufacturing a device in accordance with that disclosed and claimed in U.S. Patent Application number 09/661,547. A photocopy of the engineering drawings prepared by L. Robin Johnson, from which dates and engineering tolerances have been redacted, is attached hereto as Exhibit B.
- c. Prior to April 27, 1999, I requested the preparation of various components from which to assemble devices in accordance with the invention disclosed and claimed in U.S. Patent Application number 09/661,547, as evidenced by a photocopy of a laboratory request EL-98-04-037, from which dates have been redacted, and which is attached hereto as Exhibit C.
- d. Prior to April 27, 1999, I assembled several devices in accordance with that disclosed and claimed in U.S. Patent Application number 09/661,547. A copy of photographs of one of these devices is attached hereto as Exhibit D.
- e. Prior to April 27, 1999, I requested and supervised electrical and environmental testing of the assembled devices in the FCI Qualification Laboratory located at FCI USA Inc., 825 Old Trail Road, Etters, Pennsylvania as evidenced by the copy of laboratory request EL-98-06-031, from which dates have been redacted, and which is attached hereto as Exhibit E. These tests showed the devices to work as intended.
- f. The dates redacted from Exhibits A, B, C, and E are prior to April 27, 1999.

4. All statements made herein of my personal knowledge are true, and all statements made on information and belief are believed to be true. All copies attached hereto are true and accurate copies of the originals.
5. I make the above statements with the knowledge that under 18 U.S.C. § 1001, willful false statements and the like are punishable by fine or imprisonment, or both, and may jeopardize the validity of U.S. Patent Application Number 09/661,547 or any patent issuing therefrom.

Respectfully submitted,

D. Harper  
Donald K. Harper, Jr.

Executed: September 2, 2001

**Exhibit A to  
Declaration of Donald K. Harper, Jr.**

## BERG ELECTRONICS DIVISION

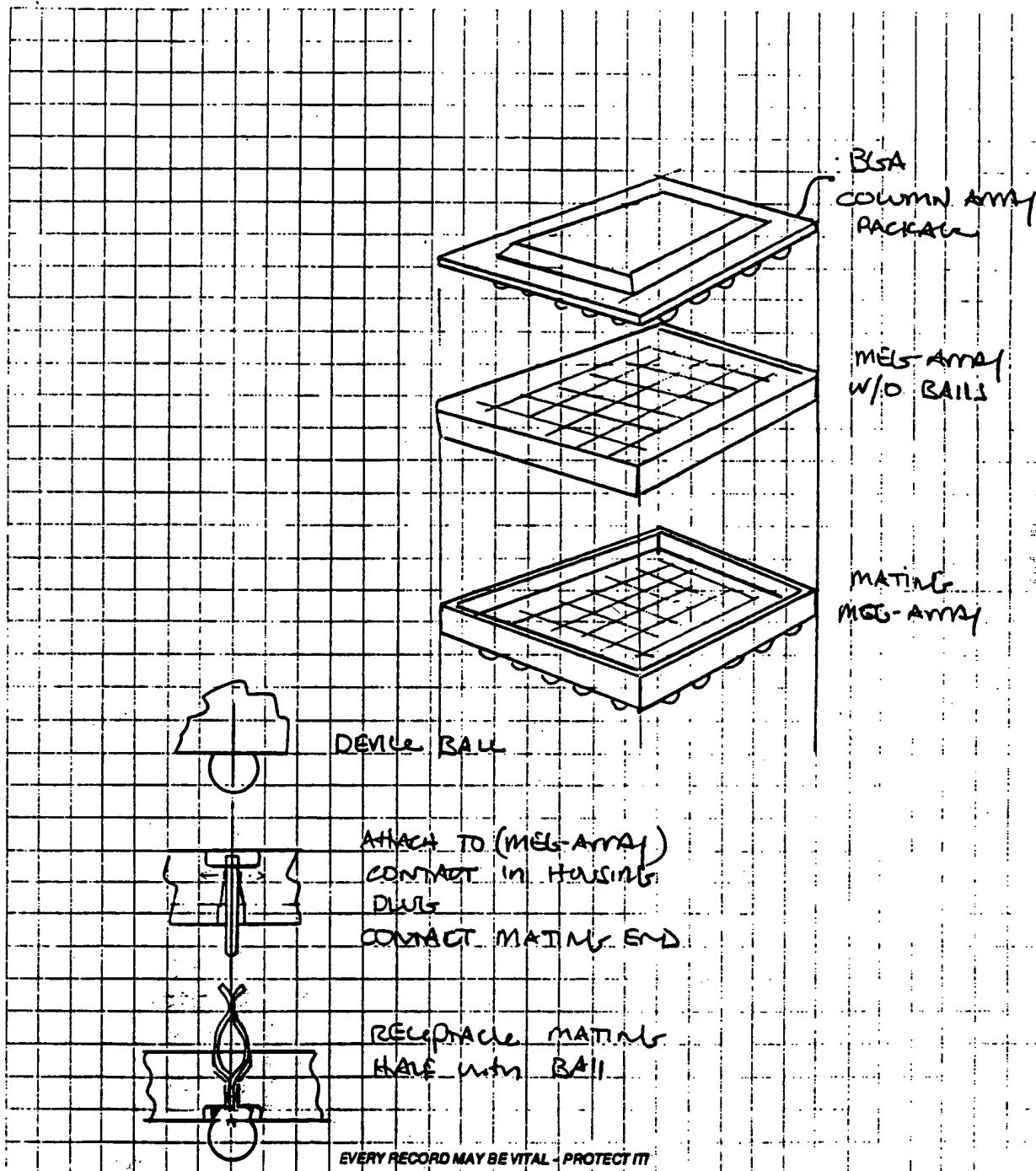
PROJECT BALL GRID AREA or  
 TITLE SOLDER COLUMN  
 SUBJECT TO MEG-ARRAY

PROJECT  
NO. \_\_\_\_\_  
DATE \_\_\_\_\_

BERG 3

398

6

SIGNED: D. Hagan

WITNESSED and UNDERSTOOD

Devin Johnson

DATE:

DATE:

### Summary of Invention

#### **BGA ball attach to MEG-Array™ connector**

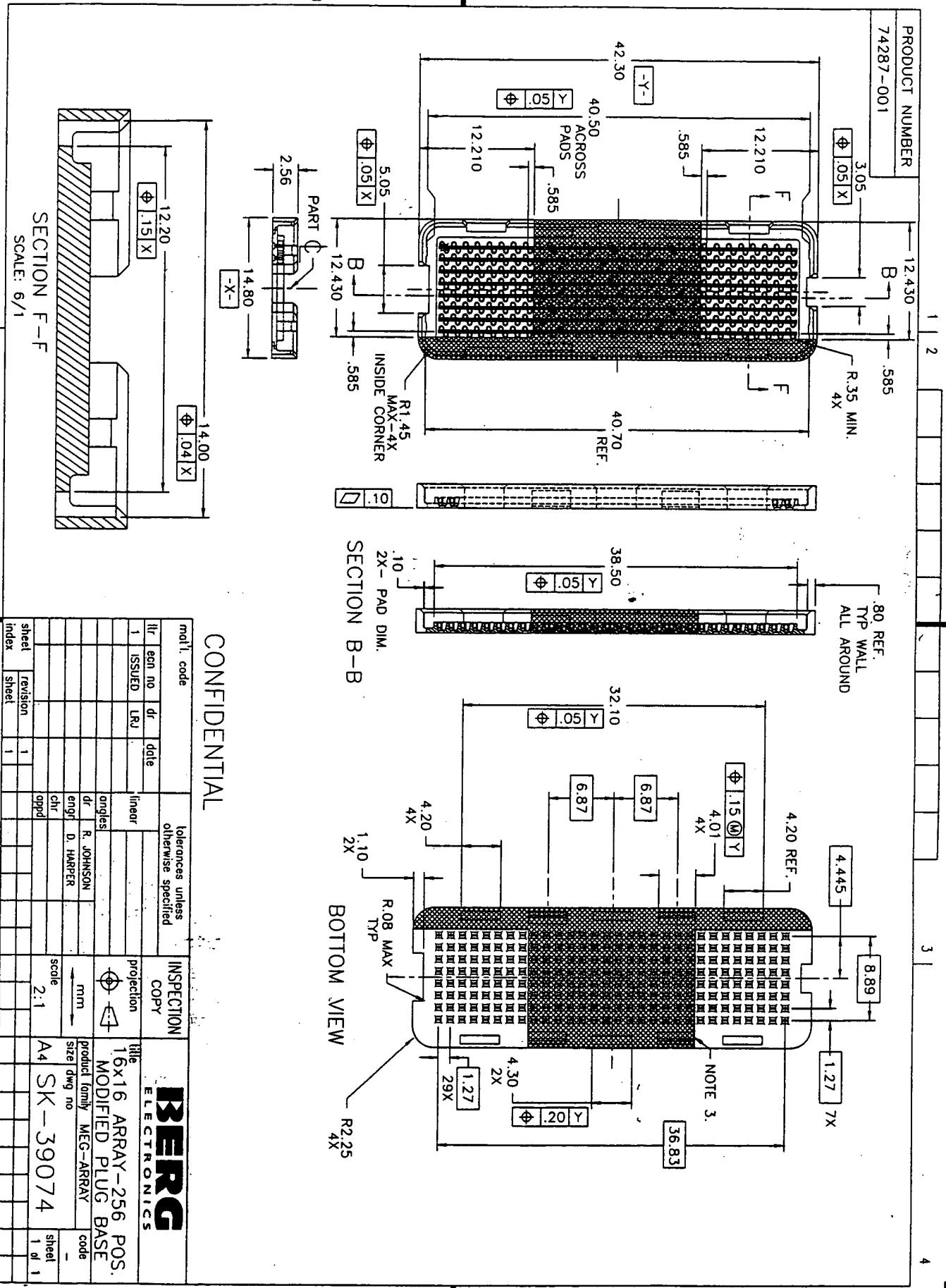
This design attaches a contact directly to the solder ball of a Ball Grid Array to provide a means for socketing the Ball Grid Array component. This contact array can then be connected to a mating array for providing an electrical connection between the two halves.

This provides the ability to socket a BGA component and then direct attach the component by using the same Printed Circuit board connection design for the BGA. An example is for the development of ASIC components.

This also provides a more reliable connection to a PCB by;

providing a compliant connection between materials with different Coefficients of Thermal Expansion (CTE). It compensates for differential expansion and contraction and minimizes the strains that occur at the solder joint interface.

**Exhibit B to  
Declaration of Donald K. Harper, Jr.**



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Technical drawing of a component labeled R1.30 REF 4X. The drawing shows a central rectangular area with a cross-hatched pattern, surrounded by a frame with various dimensions and reference points.

Key dimensions and labels:

- Top horizontal dimension: 32.00 REF.
- Right side dimension: 4.00 REF. 6X
- Left side dimension: 11.980
- Bottom right corner dimension: 12.90 REF.
- Bottom center dimension: 13.00 REF.
- Vertical dimension on left: 12.210
- Vertical dimension on right: 12.210
- Top left dimension: .585
- Top center dimension: 8.89
- Top right dimension: 1.27
- Middle left dimension: 3.00 REF.
- Middle right dimension: .585
- Bottom left dimension: .585
- Bottom right dimension: .585
- Central vertical dimension: 11.980
- Central horizontal dimension: 5.00 REF.
- Central labels: A, B, C, D, E, F, G, H
- Vertical column of numbers: 30, 29, 28, 27, 26, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1

~~CONFIDENTIAL~~

REF.

2.71

2.06

REF.

**Exhibit C to  
Declaration of Donald K. Harper, Jr.**

# U. S. PRODUCT TEST LABORATORY REQUEST

Valley Green

Date

Requestor: Don J. Harper Assigned To: B. Kidron

Acknowledge Date:

Request Number: EL 98-04-037

Part Name: MES-AVCA

Manufacturing Traceability:

Customer/Vendor:

Part Number:

Location:

Job Number:

Lab Engineer:

Check One:

QUALIFICATION  
 DEVELOPMENT  
 Data & Observations Only  
 Data Reduction & Observations  
 MANUFACTURING INSPECTION  
 Laboratory Report (Including Pass/Fail Comparison to Specification)

Work to be performed: (Include applicable specification, testing procedures or parameters)

MODIF | CBLA! Per sketch 2 PC

NOTE: DO NOT DAMAGE SOLDER BALLS  
 MECHANICAL OR THERMAL

Part: PCB OK By: B. Don Harper  The product was examined prior to testing and found to be suitable for the requested testing.

To be completed by Lab: D. K. Harp Completed ByDate: \_\_\_\_\_

Completed ByDate: 12/18/01 Completed ByDate: \_\_\_\_\_

Approval Date/Title: Lab Test - Rev. 6/97

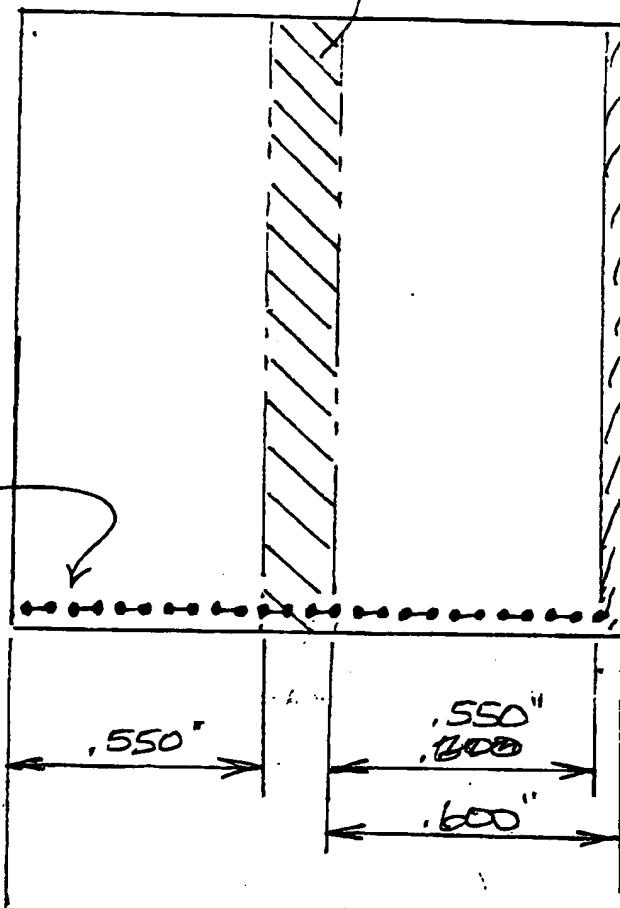
FOR BERG USE ONLY

\* DO NOT DAMAGE  
SOLDER BAILS

GRIND  
(SPLIT INTO  
TWO CHIPS)

Remove  
EDGE \*

BAILS AND  
Rectangular Shimmy  
CHIP position

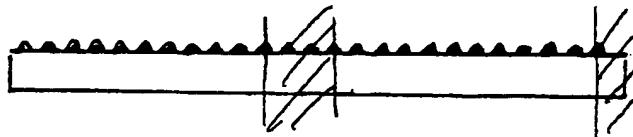


MODIFY 2PC

EL-98-04-037

$$\frac{1.282}{1.232}$$

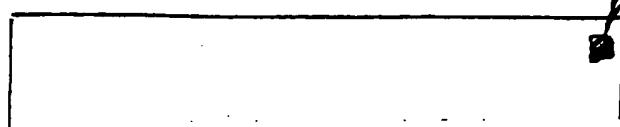
1.280  
1.150  
1.30



D.Han  
 $5\frac{19}{55}\frac{0}{9}\frac{9}{2}$

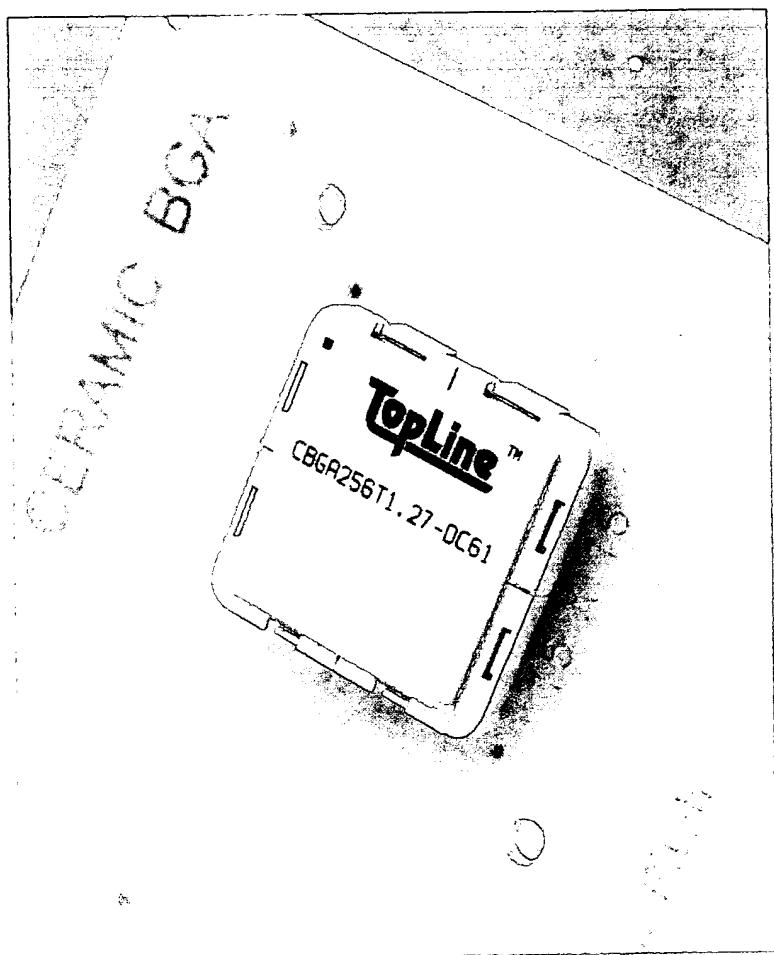
60°  
55°  
45°

Pin #1

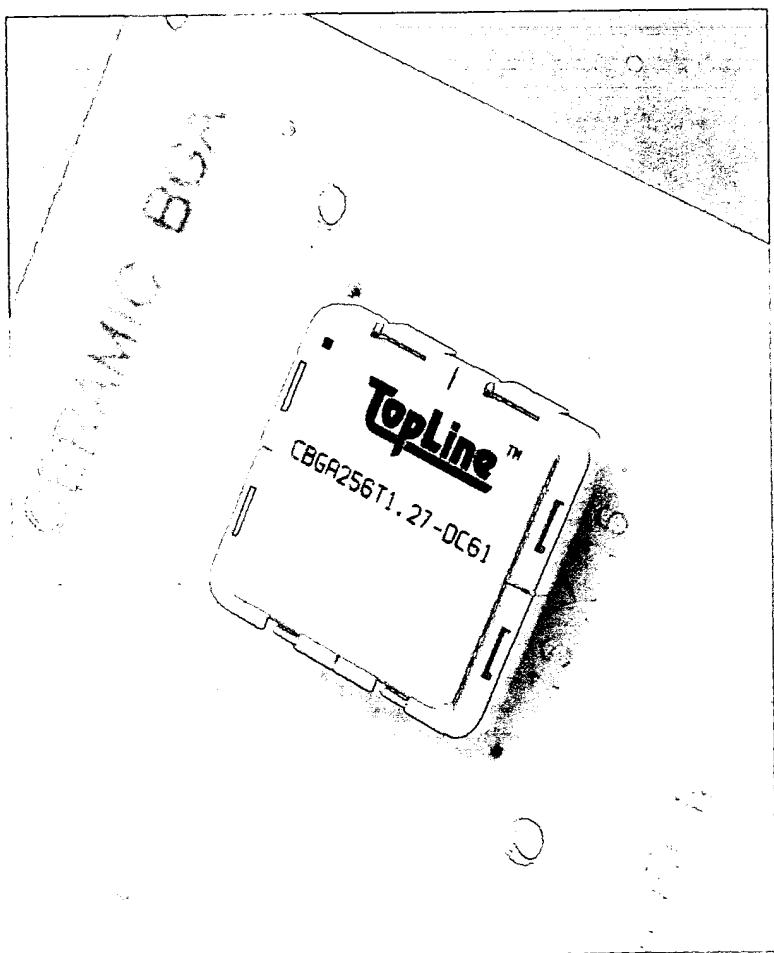


**Exhibit D to  
Declaration of Donald K. Harper, Jr.**

# Ceramic BGA



# Ceramic BGA



**Exhibit E to  
Declaration of Donald K. Harper, Jr.**

**U. S. PRODUCT TEST LABORATORY REQUEST**

Valley Green	Date	Assigned To*	Requested Completion Date:
			<i>EL-78-06-031</i>
Requestor	Request Number*	Acknowledge Date:	
DON HARPER			
Part Name	Phone	Dept #	Location
FLEX ARRAY	7193	MFGS	VGS
Manufacturing Traceability	Part Number		
Customer/Vendor	Job Number		
		Lab Engineer: <i>J. Hayes</i>	

Check One:  QUALIFICATION       DEVELOPMENT       Data Reduction & Observations       MANUFACTURING INSPECTION  
 Requested Output:  Data & Observations Only       Laboratory Report (including Pass/Fail Comparison to Specification)

Work to be performed: (Include applicable specification, testing procedures or parameters)

**Thermal cycling**

1000 cycles -25 to 100°C ✓

1) Two flex assemblies

\* see me for samples  
 DUE PENTATHRANT CRACK ANALYSIS AT 1000 CYCLES  
 TWO CERAMIC - removed @ 300 cycles due to failure  
 CRACK RECORDING IN FILE #EC-98-06-036  
*Hayes*

The product was examined prior to testing and found to be suitable for the requested testing.

Completed By/Date: *Kelton Begea*      Completed By/Date: *John Hayes*  
 Approval/Date/Title: *Tech Svc. Dept. Lead*      Completed By/Date: *John Hayes*  
 Copies to: \_\_\_\_\_

FOR BER USE ONLY

Reference BUS-03-702